

18



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

09/821,546

03/30/2001

Jin-Yuan Lee

MEG2000-012

4705

28112

7590

03/26/2003

GEORGE O. SAILE & ASSOCIATES
28 DAVIS AVENUE
POUGHKEEPSIE, NY 12603

EXAMINER

OWENS, DOUGLAS W

ART UNIT PAPER NUMBER

2811

DATE MAILED: 03/26/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/821,546

Applicant(s)

LEE ET AL.

Examiner

Douglas W Owens

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 December 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5, 7-15, 17, 19-32 and 34-41 is/are pending in the application.
- 4a) Of the above claim(s) 1-5 and 7-10 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 11-15, 17, 19-32 and 34-41 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of the invention of group II, claims 11 – 15, 17, 19 – 32 and 34 – 41 in Paper No. 10 is acknowledged. The traversal is on the ground(s) that the product claims use the product and vice versa, asserting that the field of search must cover the method and the device. The Applicant further argues that another method of making the product is speculative and has nothing to do with the claims. This is not found persuasive because if it can be shown that the product can be made by another and materially process, the inventions are shown to be distinct. Another and materially different process was presented in the restriction requirement of paper number 8. With respect to the assertion that a search of the invention of group I would require a search of the invention of group II, this is mere speculation and the applicant has not provided any evidence of this. Additionally, the two inventions are distinct since it can be seen that they each have acquired separate status in the art, as shown by their different classification.

The requirement is still deemed proper and is therefore made FINAL.

2. Claims 1 – 5 and 7 – 10 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in Paper No. 10.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 11 – 15, 17, 19, 20, 22 – 32, 34 – 37 and 39 – 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent Application Publication No. 2001/0021541 to Akram et al. in view of US patent No. 6,355,507 to Fanworth.

Regarding claims 11 and 26, Akram et al. discloses a method of forming a chip scale package, comprising the steps of:

providing one or more chips (Fig. 1, (12)) having I/O pads (Fig. 6 (16)) with UBM layer (Fig. 6 (23)) on the surface of the I/O pads;

providing a substrate (Fig. 1A(118));

applying an adhesive layer over said substrate (paragraph [0052]), forming an ad-substrate composite;

forming openings (21) in the ad-substrate composite to match the spacing of corresponding the I/O pads (16) of the chip;

attaching the chips on the ad-substrate composite wherein the I/O pads of the chips are placed on the corresponding openings on the ad-substrate composite to form a package (10);

performing ball mounting over the openings on said ad-substrate of the package (22, 24); and

forming the CSP.

Akram et al. does not teach a substrate having a thickness between 150 to 300 microns. Akram et al. does not teach an adhesive layer with a thickness between 10 to 100 microns. It would have been obvious to one of ordinary skill in the art to arrive at the optimal thickness of the substrate and adhesive layer through routine experimentation. "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Akram et al. does not teach sawing the substrate to form the CSP. Sawing is a known method of singulation and it would have been obvious to one of ordinary skill in the art to use a known and frequently practiced method of singulation.

Akram et al. does not teach forming a molding material around the package. Fanworth teaches forming a molding material around the package (Fig. 4 (32); Col. 6, lines 30 – 35). It would have been obvious for one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Fanworth into the method taught by Akram et al., since it is desirable to protect the chip from contamination and damage.

Regarding claims 12 and 27, Akram et al. teaches a method, wherein the chip comprises silicon (Paragraph [0005]).

Regarding claims 13 and 29, Akram et al. teaches a method, wherein the I/O pads are an area array type (paragraph [0048]).

Regarding claims 14 and 36, neither Akram et al. nor Fanworth teach a method, wherein the substrate comprises bismaleimide triazine having a thickness in the range

of 150 to 300 microns. It would have been obvious to one having ordinary skill in the art to utilize a substrate comprising bismaleimide triazine since it is a known material that is well suited for the intended use. The selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). It would have been obvious to one of ordinary skill to arrive at the optimal thickness of the molding through routine experimentation.

Regarding claims 15 and 37, Akram et al. teaches a method, wherein the substrate comprises a ball grid array.

Regarding claims 17 and 32, Neither Akram et al., nor Fanworth teach a method, wherein the adhesive layer comprises polyimide thermocompression adhesive. Polyimide thermocompression adhesive is a known material that would have been obvious to use since it is well suited for the intended use.

Regarding claims 19 and 34, Akram et al. teaches a method, wherein forming the openings is accomplished by mechanical or laser drilling , or screen printing (paragraph [0084]).

Regarding claims 20 and 35, neither Akram et al., nor Fanworth teach a method, wherein the openings have a diameter between 350 to 900 microns or 250 – 750 microns. It would have been obvious to one of ordinary skill to arrive at the optimal diameter through routine experimentation.

Regarding claims 22 and 41, Akram et al. does not teach a method, wherein the molding comprises epoxy resin. Fanworth teaches a method, wherein the molding

comprises epoxy resin. It would have been obvious to one of ordinary skill to incorporate the teaching of Fanworth into the method taught by Akram et al. for reasons discussed above.

Regarding claim 23, Akram et al. and Fanworth do not teach a device wherein the molding material has a thickness between 100 to 500 microns. It would have been obvious to one of ordinary skill to arrive at the optimal thickness of the molding through routine experimentation.

Regarding claims 24 and 39, Akram et al. does not teach a method, wherein the ball mounting is accomplished with a solder comprising tin-lead or tin-silver alloy. Fanworth teaches a method, wherein the ball mounting is accomplished with a solder comprising a tin-lead alloy (Col. 5, lines 29 – 34). It would have been obvious to incorporate the teaching of Fanworth into the method taught by Akram et al. for reasons discussed above. Additionally, the tin-lead alloy and tin-silver alloy are known materials that are well suited for the intended use.

Regarding claims 25 and 40, neither Akram et al. nor Fanworth teach a method, wherein the height of the ball mountings is between 300 and 800 microns. It would have been obvious to arrive at the optimal height through routine experimentation.

Regarding claim 28, neither Akram et al. nor Fanworth teach a method, wherein the I/O pads comprise an aluminum alloy or copper. Aluminum alloys and copper are known materials that are commonly used for I/O pads because of their low resistivity. It would have been obvious to one of ordinary skill to use an aluminum alloy or copper for the I/O pad since they are known materials that are well suited for the intended use.

Regarding claim 30, Akram et al. does not teach a method, wherein the UBM layer comprises nickel and/or copper. Fanworth teaches a method, wherein the UBM layer comprises nickel (Col. 5, lines 1 – 3). It would have been obvious to incorporate the material taught by Fanworth into the method of Akram et al. since it is a known material that is well suited for the intended use.

Regarding claim 31, Akram et al. teaches a method, wherein forming the adhesive layer comprises lamination, spin coating, or screen printing (paragraph [0079]).

5. Claims 21 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akram et al. and Fanworth as applied to claims 11 – 15, 17, 19 – 20, 22 – 32, and 34 – 37 above, and further in view of US patent No. 6,265,782 to Yamamoto et al.

Neither Akram et al., nor Fanworth teach a method, wherein the attaching is accomplished by subjecting the adsubstrate to a temperature between 250° to 350° C at a pressure between 1.5 to 2.5 Mega Pascals. Yamamoto et al. teaches a method, wherein the attaching is accomplished by subjecting the adsubstrate to a temperature between 250° to 350° C at a pressure between 1.5 to 2.5 Mega Pascals (Col. 9, lines 31 – 33 and 42 – 44). It would have been obvious to incorporate the method taught by Yamamoto et al. into the proposed method taught by Akram et al. and Fanworth since it is desirable to form a satisfactory bond.

Response to Arguments

6. Applicant's arguments filed September 9, 2002 have been fully considered but they are not persuasive.

The applicant argues that the claimed method of the instant invention is different from that of the cited references because the order of the processing steps is different. There is nothing in the claim language that would require the processing steps be performed in any particular order. The claims only require that certain steps be performed.

7. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., a very thin substrate or a very thin adhesive) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Additionally, it is common in the art to scale components of semiconductor devices as well as being an industry wide goal. It is not considered inventive to scale down semiconductor packages.

Conclusion

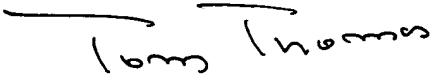
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas W Owens whose telephone number is 703-308-6167. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 703-308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Art Unit: 2811

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

DWO
March 23, 2003


TOM THOMAS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800